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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/087,741 | 03/05/2002 | Sang-Hyuck Ahn | 6161.0013.AA | 7018 |
| 7590 | 03/02/2004 | | EXAMINER | |
| McGuire Woods Suite 1800 1750 Tysons Boulevard McLean, VA 22102-4215 | | | | KRISHNAN, SUMATI |
| | | ART UNIT | | PAPER NUMBER |
| | | 2875 | | |

DATE MAILED: 03/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/087,741 | AHN ET AL. | |
| | Examiner | Art Unit | |
| | Sumati Krishnan | 2875 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on ____.
- 2a) This action is **FINAL**. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) Claim(s) ____ is/are allowed.
- 6) Claim(s) 1-15 is/are rejected.
- 7) Claim(s) ____ is/are objected to.
- 8) Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on ____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. ____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

| | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____ . |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date ____ . | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| | 6) <input type="checkbox"/> Other: ____ . |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1-2, 4-6, 10, 11 and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Kurokawa et al (US 6645402).

Regarding claims 1, 4, 6, 10 and 15 Kurokawa discloses a method for fabricating a field emission display comprising forming a cathode electrode (2) on a substrate (1), forming an emitter (3) having a carbon-based material on the cathode electrode, depositing an emitter surface treatment (6) agent on the substrate to cover the emitter, hardening the emitter surface treatment agent using a heat treatment method (see column 8 lines 55-65) and removing the hardened emitter surface treatment agent from the substrate such that the carbon based material contained in the emitter can be exposed, (see column 8 lines 65-68, column 9 lines 1-5 and figure 4).

Regarding claim 2 and 5, Kurokawa discloses the method of depositing the carbon based material on the cathode, see column 18 lines 24-27 which discloses the emitter deposited by a spin coating or printing method. Kurokawa also discloses heat treating the printed paste at a

temperature lower than a complete baking temperature for the paste, see column 12 lines 5-10 in view of lines 19-25.

Regarding claim 11, Kurokawa's emitter is used in a field emission display.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-4 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al (US 6436221) in view of Kurokawa et al (US 6645402).

Regarding claim 1, Chang discloses a method for fabricating a field emission display comprising the steps of forming a cathode electrode (conductive pattern coated on substrate, see abstract), forming an emitter having a carbon based material (CNT, see abstract) on the cathode electrode, and depositing an emitter surface treatment agent on the substrate to cover the emitter (adhesive film, see abstract), and removing the hardened emitter surface treatment agent from the substrate such that the carbon based material contained in the emitter can be exposed, see columns 3-4 lines 49-67, and 1-5. Chang does not disclose the step of hardening the surface treatment agent, as Chang's surface treatment agent is already hardened before deposition. However, Kurokawa discloses a method of for fabricating a field emission display wherein the

surface treatment agent 6 is deposited and then hardened, see Kurokawa column 8 lines 55-65. It would have been obvious to modify the invention of Chang to include hardening the surface treatment agent after deposition, (as disclosed in Kurokawa), versus before deposition because hardening “in-situ” increases efficiency by reducing the number of steps required in the process of manufacturing.

Regarding claims 2 and 3, Chang discloses forming the emitter on the cathode by printing a paste through a mesh patterned screen, see abstract.

Regarding claim 4, the carbon based material is a carbon nanotube, CNT.

Regarding claim 8, Chang discloses the method of claim 2, wherein the printed paste (CNT) is heat treated at the temperature of about 350-430 degrees C, (see abstract, Chang’s CNT is sintered at a temperature of about 35-550 degrees C). Chang however does not explicitly disclose the duration of the sintering process. However, it is well known in the art to heat treat the carbon nanotubes for a few minutes at such a temperature in order to successfully perform curing. Therefore, it would have been obvious to one of ordinary skill in the art to have heat treated Chang’s CNT for about 2 minutes, as is claimed, in order to solidify the CNT on the cathode electrode.

3. Claims 7 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurokawa et al. (US 6645402) in view of Howard et al (US 6623720).

Kurokawa discloses the method of claim 1, but does not specifically disclose the surface treatment agent 6 being a polyimide. However, Howard discloses a method of making a field emission display using carbon nanotubes wherein a sacrificial layer made of a polyimide is deposited and then removed to better expose the nanotubes, see column 4 lines 5-10. Howard discloses that the removable sacrificial layer (or “surface treatment layer”) should be made of a material that doesn’t have detrimental effects to the emissive layer, and teaches a polyimide to be suitable. Therefore, it would have been obvious to one of ordinary skill in the art to use a polyimide material for the surface treatment because it is a non harmful suitable material for a removable surface treatment layer, as evidenced by Howard.

5. Claims 9, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurokawa et al (US 6645402) in view of Murata et al (US 6013238).

Kurokawa disclose the method of claim 6, but does not disclose using a hot plate for heating the surface treatment agent. However, Murata’s disclosure at column 13 lines 65-67 makes it clear that the hot plate method is a well known, conventional method used for heating elements in field emission display. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a hot plate instead of the process of heating as disclosed by Kurokawa – since applicant has not shown that any particular advantage comes of using a hot plate at 90 degrees C for 20 minutes versus the method as disclosed by Kurokawa, it is argued that it would have been obvious to use either method as the heat treatment method of the surface treatment agent, since both produce the same result -- curing of the film.

Response to Arguments

Applicant's arguments with respect to claims 1-9 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sumati Krishnan whose telephone number is 571-272-2372. The examiner can normally be reached on 8:00 am - 4:30 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on 571-272-2378. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SK


Stephen Husar
Primary Examiner